possible, based on the opinions of the manufacturers. As Mr. Howard said, it is gratifying to know that in this investigation the institute can rely on the cooperation of so many leaders of industry, among whom are ironmasters, alkali, acid and general chemical manufacturers, brewers, cement makers, and representatives of dyeing, calico printing, and other important industries. A technical chemist possessing all the qualifications suggested by the manufacturers would be at once a competent mechanical engineer, electrical engineer, architect and surveyor, accountant and book-keeper, draughtsman, patent agent, and lawyer, in addition to being a capable chemist, and he would possess also special personal qualities, including the power of organisation, tact and general business capacity. The committee is strongly inclined to think that it is possible so to direct the post-graduate studies of the young chemist that he may adapt himself to technical practice, and thus not only improve his own position, but be better qualified to bear his part in the prevailing struggle of industry.

THE King on April 28 laid the first stone of the new buildings for the Royal College of Science, Ireland, which are situated at Leinster Lawn, Dublin. The ceremony was commenced by the reading of an address by Sir Horace Plunkett, vice-president of the Department of Agriculture and Technical Instruction for Ireland, reviewing the work of the department as a whole, and especially that part of it entrusted to the Royal College of Science for Ireland. Referring to the latter, the address comments on the assistance received by the department from local authorities in the work of developing a system of technical instruction throughout Ireland, and points out the national value of a complete system of education. The King, in reply to the address, expressed his pleasure at performing the ceremony, and continued :—" In these days scientific training is an indispensable condition of success in commercial and industrial life. To be thoroughly effective it requires all the help which research and modern appliances can give. You are therefore wise in providing the improved equipment and the widened opportunity for instruction which this college will henceforth supply. You have told me that the efforts of your department to extend scientific education among the people have been supported by popular sympathy, and by the cooperation of representative public bodies. I am glad to receive this assurance; for without such sympathy and cooperation any scheme of technical instruction, however well devised, must fail to come into close touch with the life of the people, and must fall short of complete success. I agree with you in thinking that a complete system of education is necessary for the full realisation of your aims; and my best wishes go with your efforts to improve the intellectual and material conditions of the country." During his Irish visit the King also took another opportunity of emphasising the value of education in assisting the development of a country. At Kilkenny, in reply to addresses from a number of bodies, including the Kilkenny Agricultural Society, His Majesty said :—" I notice with pleasure the earnest efforts which are now being made for the industrial development of Ireland, and especially for the promotion of the agricultural industry, in which I take great practical interest. Agricultural prosperity, in my judgment, depends largely upon improved educational methods, cooperation, and better facilities for distributing produce. I am glad to know that, along these lines, progress is now being made in Ireland."

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, April 21.—Prof. S. H. Vines, F.R.S., president, in the chair.—Mr. Clement **Reid** exhibited drawings by Mrs. Reid of fruits and seeds of British pre-Glacial, inter-Glacial, and Roman plants: 2nd series—Calycifloræ. The most interesting addition to the inter-Glacial flora is the south European *Cotoneaster Pyracantha*, which occurs abundantly on the Sussex coast in deposits which yield also *Acer monspessulanum, Najas minor*, and *N. graminea*. The pre-Glacial Calycifloræ include *Trapa natans*, but the rest of the species yet determined are still living in Britain; many, however, need further examination. The plants from Roman Silchester include the vine, bullace, damson, and coriander.—Dr. O. Stapf, on behalf of Mr. W. B. **Hemsley**, exhibited some specimens of *Primula vulgaris*, Huds., which displayed the phenomenon of phyllody of the calyx in an unusual degree.

Physical Society, April 22.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—Calculation of colours for colour sensitometers and the illumination of " three-colour " photographic transparencies by spectrum colours: Sir W. de W. **Abney**. In three-colour photography, photographs have to be taken through a red, a green, and a blue screen, the transparencies or prints from which are then viewed. The exact shades and hues of these screens depend on the light which is used for viewing the transparencies or on the colours employed in printing. The present paper confines itself to the former case.—Normal piling as connected with Osborne Reynolds's theory of the universe: Prof. J. D. **Everett**. The paper maintains that, in a struggle for existence between different kinds of closest piling, represented by separate clusters with room to change their arrangements, normal piling possesses great advantages, first, in its six sets of lines of spheres, which serve as battering rams, and secondly, in its four sets of tiers in closest array, which facilitate the coalescence of adjacent clusters.—Note on the diffraction theory of the microscope as applied to the case when the object is in motion: Dr. R. T. **Glazebrook**. According to the Abbe theory of microscopic vision, when a grating is placed on the stage of a microscope and illuminated by plane waves, diffraction images are formed in the focal plane of the object-glass and the images in the view-plane result from these, and this is undoubtedly true. It is proved in this paper that the image in the view-plane may change without an alteration in the *position* of the diffracted images.—An " automatic gas-pump " was exhibited by Mr. C. E. S. **Phillips**. The apparatus is constructed upon a plan which enables the pump, when once set in operation, to continue automatically and to produce as perfect a Torricellian vacuum as is possible.

EDINBURGH.

Royal Society, March 21.—Prof. Flint in the chair.—Dr. J. Erskine **Murray** exhibited and explained a differentiating machine, by means of which the first derivative of a given curve could be traced mechanically. A rod A is pinned at one end to a rectangular frame so as to be capable of revolution in the plane of the frame. A second rod B is retained by guides on the frame so as to be capable of motion only in the direction of its length. A pin in B engages in a longitudinal slot in A, and thus the distance between B and the pin about which A revolves is constant. The displacement of B relatively to the frame is therefore proportional to the tangent of the angle of inclination of A. If the revolving rod A be guided by hand so as to be always tangential to the given curve, a curve the coordinates of which are proportional to the differentials of the original curve is traced out by any point on B. The frame supporting the rods is free to move in direction X at right angles to the rod B. In order to eliminate the y-coordinate of the original curve, the board on which the derived curve is traced is free to move in OY but not in OX.—Dr. J. **Halm** gave an account of his spectroscopic observations of the rotation of the sun, which had been carried on at the Royal Observatory, Edinburgh, since 1901. The method employed was essentially that used by Duner, but some simplification and greater steadiness of the apparatus had been secured by the employment of a siderostat and heliometer. The results so far obtained seem to point to a decisive influence of solar activity upon the surface rotation. By arranging the results in two groups, one comprising the observations of 1901–2, a time of sun-spot minimum, and the other those of 1903, at a period of vigorously renewed solar activity, Dr. Halm obtained undoubted evidence of the existence of systematic differences between these two groups of quite unexpected magnitude. The decrease of angular velocity from the equator towards the poles, as observed in 1901–2, agreed very well with that found by Duner in 1887–9, also at a time of sun-spot minimum. But the appearance of spots in 1903 was accompanied by an extraordinary increase of angular velocity in high latitudes. It seemed as if the spots had caused the superficial layers to rotate more in accordance with the law of rotation of a rigid body, a mode of statement, however, which was not to be accepted as involving any physical theory.—In a paper on the viscosity of aqueous solutions of chlorides, bromides, and iodides, Dr. W. W. **Taylor** and Mr. Clerk **Ranken** gave determinations of the relative viscosities of KCl, KBr, KI, HCl, and HBr, in solutions containing 1 mol., 2 mol., and 3 mol. per litre at 0°, 15°, and 25°. The effect of temperature change and concentration on the viscosity was found to be different for the chlorine, bromine, and iodine solutions. The molecular conductivities of the fifteen solutions at 0° were also determined, and showed no greater differences than for solutions of similar concentration at 18°.—In a note on the unit of relative viscosity and on negative viscosity, Dr. W. W. **Taylor** pointed out the disadvantages of expressing the relative viscosities of solutions by taking as unit the viscosity of the solvent at the temperature of experiment. Instead, they should all be referred to water at 0° as standard. Until quite recently only aqueous electrolytes were known to exhibit the phenomenon of "negative viscosity," *i.e.* the viscosity of the solution less than that of the solvent at the same temperature. According as the temperature coefficient of the solution is greater or less than that of the solvent, a solution may exhibit negative viscosity at high temperatures or at low temperatures.—In a paper on the action of chloroform on the heart and arteries, Prof. **Schäfer** and Dr. **Scharlieb** showed, as had been previously proved by Gaskell, McWilliam, Hill, Embley, Sherrington, and others, that chloroform has a powerfully paralysing action upon the mammalian heart, inducing in it a condition in which all irritability is lost, and is only recoverable by washing away the poison by passing a stream of unpoisoned blood or saline solution through the cardiac vessels. They further show that this paralytic condition is not due to vagal inhibition, which is only rarely to be seen in chloroform anæsthesia, and is then probably due to dyspnœa; it is therefore not capable of being antagonised by atropine. Even such a powerful agent as suprarenal medulla, which is one of the strongest cardiac stimulants known, is powerless to provoke contraction in a heart paralysed by chloroform. But sometimes artificial respiration by chest compression may, by inducing some sort of circulation through the coronary vessels, cause the removal of the drug from the heart. No benefit has been obtained by directly "massaging" the heart. The addition of a small percentage of ammonia vapour to the chloroform-laden air used for inhalation is shown to have a markedly beneficial effect upon the result, the heart's force and the blood pressure and respiration being maintained far better than with chloroform alone. Alcohol vapour has a similar but less marked effect. On the other hand, too large a proportion of ammonia vapour is liable to produce instant and permanent arrest of the heart's action. While the respiration usually stops before the heart, in some cases the cessation is simultaneous, and in a few the heart ceases before the respiration. After having completely stopped the heart may after a minute or two recommence to beat, but the respirations rarely begin again spontaneously, except that, as in asphyxia, a staircase of about a dozen respirations may make its appearance long after the ordinary respiratory movements have ceased. These are, however, ineffectual to produce recovery, and if artificial respiration be not resorted to the heart soon ceases permanently. The effect of chloroform upon the arterioles has been determined both in the frog and in the isolated mammalian kidney by perfusion of Ringer's solution containing dissolved chloroform. In the frog, solutions containing from 1 in 200 to 1 in 20,000 produce constriction of arterioles in proportion to the amount of chloroform contained in solution. In the mammal, while stronger solutions (such as 1 in 500) produce powerful constriction of arterioles, dilatation is obtained with weaker solutions (1 in 5000), a strength which in the frog produces marked contraction. This confirms an observation by Dr. C. J. Martin, recently communicated to the Physiological Society. Further experiments are needed to clear up this discrepancy between the results in the frog and mammal.—Mr. G. A. **Carse** communicated a paper on the thermal expansion of solutions of the hydroxides of sodium barium, and strontium, in each of which the volume of the solution is less than that of the water used in its preparation. In the case of sodium hydroxide the expansion in all cases, whether positive or negative, increased algebraically with rise of temperature. The same was true for strontium hydroxide. In the case of barium hydroxide the expansion was so small and the variation with temperature so slight that nothing definite could be predicated, although all solutions examined agreed in giving negative expansion. With sodium hydroxide the maximum contraction point slowly shifted towards the concentration origin with rise of temperature.—Mr. John **Dougall** presented a complete and elaborate discussion of the analytical theory of the equilibrium of an isotropic elastic plate. The solution was obtained in the first instance for an infinite plate, and was then applied to cases of finite plates.—The Rev. F. H. **Jackson** communicated a theorem relating to a generalisation of the Bessel function.

PARIS.

Academy of Sciences, April 25.—M. Mascart in the chair.—Report presented by the commission charged with the scientific control of the geodesic operations at the equator. A description of the work done during the year 1903, and a sketch of that proposed for 1904 and 1905. Unfavourable meteorological conditions interfered considerably with the work done last year.—M. Bigourdan was elected a member in the section of astronomy in the place of the late M. Callandreau, and M. Gordan a correspondant for the section of geometry in the place of the late Prof. Salmon.—Note on an earthquake at Roustchouk, in Bulgaria, communicated by the French consul.—Observations on the comet 1904 *a* (Brooks), made at the Observatory of Besançon: P. **Chofardet.** On April 19 the comet appeared as a star of the ninth magnitude, with a rounded head 1′ in diameter, and with a central nucleus. There was a slight tail from 2′ to 3′ in length in the direction of the south-west.—Observations on the comet 1904 *a* (Brooks), made at the Observatory of Paris: M. **Salet.**—Provisional elements of the Brooks comet (1904, April 16): G. **Fayet.**—The Leonids in 1903, and the determination of their height by means of simultaneous observations: Maurice **Farman,** Ém. **Touchet,** and H. **Chrétien.** The simultaneous observations were carried out at stations 28·7 kilometres apart, and results were obtained for eighty-three meteors. The average height of the first appearance was 103·6 kilometres (extremes 138·5 and 53·9), of disappearance 75·8 (extremes 131·6 and 33·4), the average length of the trajectory being 35·2 kilometres.—On the singularities of analytical functions: L. **Zoretti.**—An attempt at a determination of the difference of longitude chronometrically: Paul **Ditisheim.** The difference of longitude between Paris and Neuchâtel was determined by carrying with special precautions five chronometers between the two places, the mean result being 18m. 28·86s. It is proposed to check this by a new telegraphic determination.—On the fall of water in rivers: Edmond **Maillet.**—On the melting point of gold and the expansion of some gases between 0° and 1000° C.: Adrien **Jacquerod** and F. Louis **Perrot** (see p. 14).—On the atomic weights of hydrogen and oxygen, and on the probable value of their atomic ratio: Ph.-A. **Guye** and Ed. **Mallet.** The method proposed by Vallier for treating a limited number of observations is applied to the reduction of the observations of E. W. Morley on the atomic weights of hydrogen and oxygen. The final value is $O=15\cdot8787$ for $H=1$.—Experimental researches relating to some cyclic amines: P. **Lemoult.** The heats of combustion of some amines calculated by means of the formula given by the author in a previous paper show in a few cases wide deviations, and it appeared advisable to re-determine experimentally some of these measurements. The results of determinations made with the Berthelot bomb for xylidine, monoethylaniline, *p*-anisidine, α-naphthylamine, and β-naphthylamine are given, and agree with the figures calculated from the formula within 0·5 per cent.—The formation of hydrogen silicide by direct synthesis from its elements: A. **Dufour.** At a very high temperature, hydrogen and silicon unite directly to form hydrogen silicide. The amount formed is small, and the product was identified by its chemical reactions and its boiling point (−116° C.).—The lead-aluminium alloys: H. **Pécheux.** Alloys containing 93, 95 and 98 per cent. of aluminium were obtained, the properties of which are described.—On colloidal gold: M. **Hanriot.** Colloidal gold, prepared by the method of Henrich, exhibits properties which are inconsistent with the assumption that it consists merely of finely divided gold.—A new indicator and its application to the detection of boric acid: Lucien **Robin.** The indicator proposed is extracted from mimosa flowers by weak alcohol. Its general behaviour is similar to that of phenol-phthalein, with the advantage that it can be used in the presence of ammonia. It gives a characteristic reaction with borates, and may be used for this purpose in the analysis of food products.—The action of magnesium and organo-magnesium compounds on bromophenetol: V. **Grignard.** Bromophenetol reacts readily with magnesium powder, giving ethylene and $C_6H_5O : MgBr$ instead of the normal compound $C_6H_5OCH_2CH_2MgBr$.—On the lactone of oxycrotonic acid and the γ-substituted crotonic acids: M. **Lespieau.**—Researches on the dinaphthopyranic series: R. **Fosse.**—Remarks on some peculiarities of the flora of Long Island: Ph. **Eberhardt.** The views of the author given in previous papers on the influence of the amount of atmospheric moisture on the growth and development of plants have received confirmation from a study of the growth of vegetation on Long Island.—Researches on the browning of the vine: L. **Ravaz.** The browning of the vine is a particular case of impoverishment of the plant brought about by production. It may be avoided by the use of manures rich in potash.—On the evolution of the relief of the plateau of Mehedinti, Roumania: E. **de Martonne.**—On the faults and undulations of the secondary and tertiary layers of the Loir: Jules **Welsch.**—On an albumen extracted from the eggs of fishes: the comparative chemistry of the sexual products in the same species: L. **Hugounenq.**—Autolysis of the tissues of the animal organism and the genesis of morbid phenomena: A. **Charrin.**—The colloidal state of metals in mineral waters; natural oxydases and their therapeutic action: F. **Garrigou.**—On a mechanical apparatus allowing of trepanning and vibratory massage: M. **Bercut.**

DIARY OF SOCIETIES.

THURSDAY, May 5.

Royal Society, at 4.—Election of Fellows.—At 4.30—Experiments on a Method of Preventing Death from Snake Bite, capable of Common and Easy Practical Application: Sir Lauder Brunton, F.R.S., Sir Joseph Fayrer, Bart., F.R.S., and Dr. L. Rogers.—A Research into the Heat Regulation of the Body by an Investigation of Death Temperatures: Dr. E. M. Corner and Dr. J. E. H. Sawyer.—(1) A Note on the Action of Radium on Micro-organisms; (2) Further Note on Some Additional Points in Connection with Chloroformed Calf Vaccine: Dr. A. B. Green.—On Certain Physical and Chemical Properties of Solutions of Chloroform in Water, Saline, Serum and Hæmoglobin. A Contribution to the Chemistry of Anæsthesia—Preliminary Communication: Prof. B. Moore and Dr. H. E. Roaf.

Linnean Society, at 8.—British Freshwater Rhizopoda: J. Cash.—On Coloration in Animals and Birds: J. Lewis Bonhote.—On the Cranial Osteology of the Fishes of the Families Mormyridæ, Notopteridæ and Hyodontidæ: Dr. W. G. Ridewood.

Röntgen Society, at 8.30.—The Röntgen Society; its Past Work and Future Prospects: J. J. Vezey.—Some Experiments with Alpha Rays: F. H. Glew.

Chemical Society, at 8.—The Slow Combustion of Ethane: W. A. Bone and W. E. Stockings.—Note on the Hydrolysis of Starch by Diastase: J. S. Ford.—The Reesin Acids of the Coniferæ. Part I. The Constitution of Abietic Acid: T. H. Easterfield and G. Bagley.—The Action of Radium Rays on the Halides of the Alkali Metals, and Analogous Effects produced by Heat: W. Ackroyd.—The Dynamic Isomerism of Glucose and of Galactose. Solubility as a means of Determining the Proportions of Dynamic Isomerides in Equilibrium: T. M. Lowry.—A Study of the Substitution Products of *ar*-Tetrahydro-α-naphthylamine, *ar*-4-Bromotetrahydro-α-naphthylamine and *ar*-Tetrahydro-α-naphthylamine-4-sulphonic acid: G. T. Morgan, Miss F. M. G. Micklethwait, and H. B. Winfield.—The Additive Products of Benzylideneaniline with Methylacetoacetic Ester and Acetoacetic Ester: F. E. Francis and Miss M. Taylor.

Institution of Mining and Metallurgy, at 8.—Discussion on Laboratory Equipment (conclusion).

FRIDAY, May 6.

Royal Institution, at 9.—Anthropoid Apes: Dr. P. Chalmers Mitchell.

Physical Society, at 8.—An Experiment with Lubricating Oil: W. A. Price.—Some Instruments for the Measurement of Large and Small Alternating Currents: W. Duddell.—Exhibition of Apparatus from the National Physical Laboratories.

MONDAY, May 9.

Royal Institution, at 5.—General Monthly Meeting.

Faraday Society, at 8.—Studies in Viscosity: Dr. C. E. Fawsitt.—The Electrolytic Oxidation of Anthracine: Alberto Fontana and F. Mollwo Perkin.

Society of Arts, at 4.30.—The Majolica and Glazed Earthenware of Tuscany: Prof. R Langton Douglas.

TUESDAY, May 10.

Royal Institution, at 5.—Meteorites: L. Fletcher, F.R.S.

Society of Arts, at 8.—Crystalline Glazes and their Application to the Decoration of Pottery: W. Burton.

WEDNESDAY, May 11.

Society of Arts, at 8.—Early Painting in Miniature: R. R. Holmes.

Geological Society, at 8.—On some Quartzite-Dykes in the Mountain Limestone near Snelston (Derbyshire): H. H. Arnold-Bemrose.—Phenomena bearing upon the Age of the Lake of Geneva: Dr. C. S. DuRiche Preller.

THURSDAY, May 12.

Institution of Electrical Engineers, at 8.—I the discussion on Messrs. Merz and McLellan's paper is concluded at the meeting of May 5, Messrs. Parsons, Stoney and Martin's paper on the Steam Turbine as applied to Electrical Engineering will be read and discussed.

Mathematical Society, at 5.30.—Some Mathematical Instruments: C. Cooke (communicated by Major P. A. MacMahon).—On the Evaluation of Certain Definite Integrals by Means of Gamma Functions: A. L. Dixon.—Generalisations of Legendre's Formula

$$KE' - (K - E)K' = \tfrac{1}{2}\pi:$$

A. L. Dixon.—Note on the Integration of Linear Differential Equations: Dr. H. F. Baker.

Society of Arts, at 4.30.—British Grown Tea: A. G. Stanton.

FRIDAY, May 13.

Royal Astronomical Society, at 5.

Malacological Society, at 8.—List of Mollusca collected during the Commission of H.M.S. *Waterwitch* in the China Seas, 1900–1903, with Descriptions of New Species: Surgeon K. Hurlstone Jones, R.N., and H. B. Preston.—On a Carboniferous Nautiloid from the Isle of Man: G. C. Crick.—Notes on the Genus Anoma: E. R. Sykes.—New Land Shells from New Zealand: Henry Suter.

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